ARMY MULTIFUNCTIONAL INFORMATION DISTRIBUTION SYSTEM-LOW VOLUME TERMINAL 2 (MIDS-LVT 2)

Joint ACAT ID Program (Navy Lead)		**Prime Contractor**
Total Number of Systems:	87+	Terminal Production: MIDSCO
Total Program Cost (TY$):	$100	Production: Viasat
Average Unit Cost (TY$):	$273	
Low-Rate Initial Production:	3QFY00	
Full-rate production:	3QFY02	
Limited User Test (LUT)	1QFY00	
Initial Operational Test and Evaluation (IOT&E):	2QFY02	

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The Army Multifunctional Information Distribution System-Low Volume Terminal 2 (MIDS-LVT 2) provides Link 16 digital data communications to Air and Theater Missile Defense Command and Control (C^2) host systems, providing a ***common relevant operational picture*** of theater air activity. Link 16 provides a robust and jam-resistant network for **Joint and Multinational Force** data sharing. The early warning and air track identification information provided by Joint sensor and C^2 platforms supports the coordination of long-range ***precision engagement*** fires, safe passage zones, and near real-time warnings of impending air attack—contributing to ***full-dimensional protection***. The air surveillance and weapons coordination engagement options provided by Link 16 implementation enables ***synchronized operations*** and employment of ***correct weapons*** for each target to generate the desired results. Engagement intentions and results assessments are shared by all network participants, contributing to improved ***decision making*** by the Battle Commanders. The MIDS-LVT 2 terminal plans to share a number of common components with the Navy's MIDS-LVT 1 and Air Force F-15 Fighter Data Link terminals, providing a significantly improved level of ***sustainment interoperability***.

The Army MIDS System includes the MIDS-LVT 2 terminal, the Joint Tactical Information Distribution System (JTIDS)/MIDS-LVT 2 Terminal Controller, the JTIDS/MIDS antenna, and the host

platform interface software and displays. The JTIDS/MIDS Terminal Controller consists of specialized software hosted on a Pentium-chip ruggedized personal computer that provides initialization and status monitoring functions.

Planned Army MIDS-LVT 2 host platforms include the PATRIOT Information and Coordination Central (ICC), the PATRIOT Battery Command Post (BCP), the Theater High Altitude Air Defense (THAAD), the Joint Land Attack Cruise Missile Elevated Netted Sensor (JLENS) system, and the Medium Extended Air Defense System (MEADS).

BACKGROUND INFORMATION

The Army developed the Link 16 capable JTIDS Class 2M terminal and procured 69 production units. These units have been fielded to the Forward Area Air Defense Command and Control (FAAD C^2), PATRIOT ICCs, and Joint Tactical Ground Stations (JTAGS). Other terminals have been delivered for near-term fielding to Air Defense Artillery Tactical Operations Centers (ADA TOCs) and to THAAD for integration engineering. The Army decided to conclude acquisition of the Class 2M and transition Link 16 requirements to MIDS in FY99, and plans to satisfy the remaining host platforms' Link 16 requirements with MIDS-LVT 2.

The Army MIDS-LVT 2 uses a number of common components designed by the international MIDSCO consortium; however, MIDS-LVT 2 does not have all the functionality of the MIDS-LVT 1 terminal. For example, MIDS-LVT 2 does not have Link 16 digital voice, Tactical Air Navigation, and has only one Receiver/Synthesizer (R/S) card instead of the MIDS-LVT 1's two R/S cards. However, MIDS-LVT 2 has unique data exchange protocol interfaces, ground power supply, and a cooling unit to support field deployment and operation.

The Army executed a Low Rate Initial Production (LRIP) buy during 3QFY00, in conjunction with the Defense Acquisition Board's approval of the overall MIDS-LVT LRIP Lot 1 acquisition. These MIDS-LVT 2 terminals will support host platform integration engineering and IOT&E scheduled for 2QFY02. Following successful IOT&E, a MIDS-LVT 2 full-rate production decision is planned for 3QFY02.

TEST & EVALUATION ACTIVITY

Testing for FY00 included both DT and OT events. A draft Army Annex to the MIDS-LVT Capstone Test and Evaluation Master Plan was developed by the Army MIDS-LVT 2 developer, Program Manager-Tactical Radio Communications Systems (PM-TRCS), and submitted to DOT&E during July 1999.

The Army Air Defense Artillery Test Directorate of the Operational Test Command conducted a Limited User Test (LUT) at Eglin AFB, FL, ranges from September 21-October 7, 1999. The objective of the LUT was to examine selected capabilities of Army MIDS in a joint environment. The LUT leveraged resources from the Air Force's F-15 Fighter Data Link (FDL) Electronic Warfare (EW) Combined Developmental Test/Operational Test and Multi-Service Operational Test (MS-OT).

For the LUT, the systems under test were two Army hosts equipped with EMD MIDS-LVT 2 terminals—these were the PATRIOT ICC and the Short Range Air Defense (SHORAD) FAAD C^2.

Other LUT Link 16 network participants were a JTIDS Class 2M equipped FAAD C2, a JTIDS Class 2H (High Power) E-3 Airborne Warning and Control System (AWACS), a JTIDS Class 2 equipped Control and Reporting Center, a Class 2 equipped F-15C/D fighter aircraft, and a FDL equipped F-15E air interdiction fighter aircraft. In addition, BIG CROW ground-based and airborne jamming systems participated, targeting FDL equipped F-15E's Link 16 communications. No EW testing was accomplished by Army systems during this event.

The Army MIDS-LVT 2 developer, PM-TRCS, completed a Logistics Demonstration (Log Demo) and a Maintenance Demonstration (M-Demo) at the contractor facility during October 1999. The objective of the two demonstrations was to evaluate maintainability goals and time standards, adequacy and suitability of tools and technical publications, Built-In Test (BIT), and allocation of logistics support and maintenance tasks.

The Log Demo was a simulated demonstration of the Organizational (O) and Intermediate (I) Level maintenance tasks. The tasks were performed in accordance with the Technical Manuals (TMs) and validated the repair times in the Maintenance Allocation Chart. Additional data was used to validate the remainder of the TMs and the tools required for maintaining MIDS-LVT2. The Radio Repair Soldier also performed a series of O and I Level maintenance tasks while outfitted in Mission Oriented Protective Posture gear.

The M-Demo was a timed demonstration of MIDS-LVT 2 Operator and Maintainer tasks using fault insertion. The maintenance tasks of fault detection and isolation were performed in accordance with the TM. Direct Support Level maintenance tasks of removing and replacing Line and Shop Replaceable Units (LRU/SRUs) were demonstrated, as were the O Level maintenance tasks of battery and air filter replacement.

The Electronic Proving Ground (EPG) independent evaluators recorded the results of the demonstrations. Both USD (A,T&L) DT&E and DOT&E representatives were permitted to observe the demonstrations. The Logistics Demonstration and M-Demo Reports were submitted to DOT&E for review.

PM-TRCS has also started reliability testing on EMD terminals as a risk-reduction toward production. The test is planned to use up to two EMD MIDS-LVT 2 terminals, operating them in an environmental chamber while operating in a network with message exchange for a total of 5,000 hours. The Army Communications Electronics Command test chambers will be used for the test. A reliability test will be conducted with LRIP terminals when they become available.

TEST & EVALUATION ASSESSMENT

The Limited User Test (LUT) scenario is planned to evaluate the contribution of Link 16/MIDS LVT 2 in defending a Joint Engagement Zone (JEZ) against the threat aircraft. This required close coordination between Air Force C^2 and Army C^2, as well as the fighters within the JEZ to prevent fratricide and de-conflict their simulated engagement of the adversaries.

The Army was able to complete two days of pilot trials and two days of record tests of the LUT in a benign (non-communications jamming) environment. Based on the BIT anomalies and related performance issues, a decision was made to defer testing in an Electronic Warfare environment.

During portions of all four days, the Army MIDS-LVT 2 and JTIDS Class 2M equipped systems participated on the Link 16 network with Air Force Link 16 host platforms and exchanged air surveillance, track identification, participant identification and location, and engagement status messages demonstrating a basic level of Joint Interoperability in an operationally realistic scenario. The E-3 AWACS also transmitted one weapons control order, "Weapons Tight" to the PATRIOT ICC. This command was successfully received and correctly displayed. Unfortunately, due to data recording problems Link 16 message data was not available, therefore message success rate analyses could not be completed.

The combination of insufficient operating hours and the loss of corroborating prevented the completion of MS-OT for Army MIDS and the evaluation of Link 16's integration impact on the Air Defense Artillery mission area; i.e., quantitative improvement in coordination of fires, reduction of fratricide, etc. These objectives will be addressed in later testing.

The LUT identified a number of Army MIDS technical and operational deficiencies:

- Initially, the Joint Link 16 network was incompatible with Army systems and the network required a workaround re-design before network entry could be achieved.

- The JTIDS network was not designed to display connectivity status, thereby not allowing Army JTIDS/MIDS operators to view the status of the overall Link 16 network.

- The transfer of Link 16 data from the MIDS-LVT 2 terminals to the host stopped after a few hours of nominal operation on both record test days. This was later discovered to be an erroneous Built-In Test indication that stopped message processing.

- There were three Army Link 16 network synchronization difficulties. These were resolved by replacing the receiver/transmitter card in the PATRIOT ICC MIDS-LVT 2 terminal; extending the height of the Link 16 antenna mast to achieve line-of-sight with the CRC when AWACS was not in the network; and correcting an operator error in FAAD C^2.

- While the training program adequately prepared the soldiers to operate the terminal, there were differences in the test terminal and network design, which ultimately required an additional instruction period to train to these differences.

PM-TRCS is implementing solutions for all of the technical hardware and software issues. The Army Signal Center has acknowledged that the training course will be improved for IOT&E. Insufficient operating time prevented the completion of the evaluation of Link 16 effectiveness contribution to the theater air and missile defense mission areas.

The Logistics and Maintenance demos demonstrated that maintainability goals were achievable. The soldier was able to use the BIT, technical publications, and tools to meet the Mean Time To Repair requirement of 30 minutes. The MIDS-LVT 2 Direct Support maintenance tools were determined to be common and suitable. In contrast to earlier Contractor Developmental Test and Evaluation results, the BIT appeared significantly improved. Fifty faults were inserted and all fifty were detected correctly (100 percent fault detection against a 98 percent detection requirement). The 95 percent criteria was met for isolating faults to one of one SRU, and the 98 percent criteria was met for isolating faults to one of three SRUs. The Logistics Demonstration and M-Demo did find a small number of hardware, software, and publications issues that were either deficient, immature, or considerations for enhancement.

The reliability test start has been delayed to allow the contractor an opportunity to troubleshoot the resolution of a cold temperature issue between the Power Amplifier and the Power Supply Assembly. Test completion is expected during 3QFY01.

CONCLUSIONS AND RECOMMENDATIONS

Army MIDS-LVT 2 evaluations completed during FY00 provided valuable and early insight into the maturity of Army MIDS and integration into the PATRIOT ICC host platform. The presence of PM-TRCS at the LUT facilitated his recognition of the deficiencies and the attendant operational impacts. While not interfering with the Operational Tester conduct of the evaluation, the developer was able to perform some troubleshooting, initiate mitigation, and re-design resolution before the LUT was terminated.

In order for an adequate test, IOT&E should evaluate the integration of Army MIDS into host platforms other than the PATRIOT ICC since that platform will receive the least quantity of MIDS-LVT 2 terminals, participated in the LUT, and has already completed JTIDS integration. Host platforms such as the PATRIOT BCP or THAAD should be considered for test and evaluation of the operational effectiveness and operational suitability of MIDS integration.

A test and evaluation event, with appropriate Operational Tester participation to evaluate LUT deficiency resolution, must be scheduled for early FY01.

Continuing emphasis must be placed on training. Operation within a Link 16 network is fairly complex and requires comprehensive sustainment training for the operators/maintainers to maintain their skills. While the Army LUT demonstrated a fair level of operator training, it did indicate some shortfalls in the areas of network monitoring and troubleshooting. Evaluations of other Service operations have also identified training area deficiencies. These include operators that are not able to correctly initialize their terminal or host platform or enter the Link 16 network; incorrectly loading crypto-variables and not recognizing or properly reacting to Interference Protection Feature alerts or other fault indications. In general, Link 16 operators are not afforded adequate practice with the actual hardware and software they will operate in the tests or the field.